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Patent and Trademark Office**

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SERIAL NUMBER	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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08/206742  
08/206742 03/14/94 JHAYLEY

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1111/1111

EXAMINER

ART UNIT PAPER NUMBER

1111

DATE MAILED: 02/06/95

This is a communication from the examiner in charge of your application.  
COMMISSIONER OF PATENTS AND TRADEMARKS

☒ This application has been examined ☐ Responsive to communication filed on \_\_\_\_\_ ☐ This action is made final.

A shortened statutory period for response to this action is set to expire 3 month(s), \_\_\_\_\_ days from the date of this letter.  
Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

**Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:**

- |   |  |
|---|--|
| 1. <input checked="" type="checkbox"/> Notice of References Cited by Examiner, PTO-892. | 2. <input checked="" type="checkbox"/> Notice of Draftsman's Patent Drawing Review, PTO-948. |
| 3. <input checked="" type="checkbox"/> Notice of Art Cited by Applicant, PTO-1449.      | 4. <input type="checkbox"/> Notice of Informal Patent Application, PTO-152.                  |
| 5. <input type="checkbox"/> Information on How to Effect Drawing Changes, PTO-1474.     | 6. <input type="checkbox"/> _____  |

**Part II SUMMARY OF ACTION**

1. ☒ Claims 1-20 are pending in the application.  
Of the above, claims \_\_\_\_\_ are withdrawn from consideration.
2. ☐ Claims \_\_\_\_\_ have been cancelled.
3. ☐ Claims \_\_\_\_\_ are allowed.
4. ☒ Claims 1-20 are rejected.
5. ☐ Claims \_\_\_\_\_ are objected to.
6. ☐ Claims \_\_\_\_\_ are subject to restriction or election requirement.
7. ☐ This application has been filed with informal drawings under 37 C.F.R. 1.85 which are acceptable for examination purposes.
8. ☐ Formal drawings are required in response to this Office action.
9. ☐ The corrected or substitute drawings have been received on \_\_\_\_\_. Under 37 C.F.R. 1.84 these drawings are ☐ acceptable; ☐ not acceptable (see explanation or Notice of Draftsman's Patent Drawing Review, PTO-948).
10. ☐ The proposed additional or substitute sheet(s) of drawings, filed on \_\_\_\_\_, has (have) been ☐ approved by the examiner; ☐ disapproved by the examiner (see explanation).
11. ☐ The proposed drawing correction, filed \_\_\_\_\_, has been ☐ approved; ☐ disapproved (see explanation).
12. ☒ Acknowledgement is made of the claim for priority under 35 U.S.C. 119. The certified copy has ☐ been received ☒ not been received  
☐ been filed in parent application, serial no. \_\_\_\_\_; filed on \_\_\_\_\_.
13. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.
14. ☐ Other

EXAMINER'S ACTION

Serial Number: 08/206,792

-2-

Art Unit: 1111

### **Part III DETAILED ACTION**

#### ***Priority***

1. Acknowledgment is made of applicant's claim for priority based on an application filed in South Africa on 2 Sept. 1993. It is noted, however, that applicant has not filed a certified copy of the priority application as required by 35 U.S.C. § 119.

#### ***Drawings***

2. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

#### ***Claim Rejections - 35 USC § 112***

3. Claim 1 is rejected under 35 U.S.C. § 112, first paragraph, as the disclosure is enabling only for claims limited a cathode having a lithium metal oxide as its composition. The specification does not describe any of the sulphide compounds used in making the cathode. See M.P.E.P. §§ 706.03(n) and 706.03(z).

4. Claims 1, rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and

Art Unit: 1111

distinctly claim the subject matter which applicant regards as the invention.

Claim 1 is confusing as the anode is made with a lithium transition metal oxide having the spinel structure  $A(B_2)X_4$ , yet A and B may be selected from Li, Ti, V, Mn, Fe and Co, thus the metal oxide does not necessarily have to be a lithium metal oxide. It appears that if a lithium metal oxide is intended then, the A must always be Li.

The Markush group containing the cations is improper. The accepted Markush terminology is "selected from the group consisting of Li, Ti, V, Mn, Fe and Co".

The oxidation state for Mn should be "3.5" as opposed to "3,5".

Also, in claim 1, the "electrically insulative lithium containing liquid or polymeric electronically conductive electrolyte" appear to be technologically inconsistent. In that, a polymeric material must be ionically conductive not electronically conductive, and the electrically insulative liquid is not clearly understood.

Lastly, in claim 1, the sulphide compound making up the cathode is not definitive as its composition cannot be ascertained.

Claim 3 is indefinite as "metal cation type" is not clear. Additionally, the claim is not further limiting the compound of

Art Unit: 1111

the anode. The claim requires one metal making up the anode, however, claim 1 similarly requires only one metal.

Claim 4 is not further limiting claim 1, in that the Markush group of claim 1 does not include a mixture of transition metal oxides, rather a single metal makes up the anode.

Claims 5 and 6 contain an improper Markush group.

Claim 7 is inconsistent with claim 1, as it requires a lithium, iron and titanium oxide making up the anode, however claim 1 states that only one metal comprises the anode. Also in claim 7, "the A sites" and "the B sites" lack antecedent basis.

Claim 8 is confusing as it requires additional metals added to the lithium and to the A and B cations, however as discussed in claim 1, the metal oxide of claim 1 does not necessarily have to have lithium. Additionally, the "the interstitial spaces" lack antecedent basis.

Claim 11 does not further limit claim 10 as claim 10 also requires only one metal cation.

Claim 12 is indefinite as it requires more than one metal cation, however claim 10 limits the cation to only one.

Claim 13 contains an improper Markush group.

Claim 14 is confusing as it requires additional metals added to the lithium and to the A and B cations, however as discussed in claim 1, the metal oxide of claim 1 does not necessarily have

Art Unit: 1111

to have lithium. Additionally, the "the interstitial spaces" lack antecedent basis.

In claims 15 "0,1" should read "0.1".

In claims 17 "layered-type" is indefinite, as "type" does not precisely define "layered".

In claim 18, "relatively" is indefinite in describing the low and high voltage as it is a relative term; additionally, "4,5" should read "4.5".

Claim 19 contains improper Markush groups; the "organic salt" should read "organic solvent"; and "appropriate mixtures" is indefinite as the meaning of "appropriate" cannot be clearly ascertained.

Claim 20 contains an improper Markush group.

#### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. § 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention

Art Unit: 1111

were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

6. Claims 1-20 are rejected under 35 U.S.C. § 103 as being unpatentable over Thackeray et al. 4,507,371.

The instant claims are drawn to an electrochemical cell having an anode made of a spinel lithium transition metal oxide of the formula  $A(B_2)X_4$  wherein A and B are cations selected from Li, Ti, V, etc. and X is oxygen or sulfur. The mean oxidation values for the components is claimed. The cathode is a lithium metal oxide or a sulphide compound. An electrolyte is used and the lithium ions are extracted from the anode and they are inserted into the cathode (claims 1 and 2). The B element can be a single metal or a mixture (claims 3-4). Specific spinel anode materials are claimed in claims 5-7. Additional metal ions may be inserted into the anode structure (claim 8). The cathode may also have a spinel structure and it is specified in claim 10 (claims 9-10). The spinel structure may be the same as the anode material and the specific structures are also claimed (claims 10-17). The voltages of the anode and cathode are also claimed (claim 18) and the electrolyte is claimed in claims 19-20.

The reference teaches an electrochemical cell having an anode made of the exact same material as the instant claims as seen in col. 1, lines 34-68). Both electrodes are made of the

Art Unit: 1111

same material (col. 1, lines 11-24). The spinel structure also contains stabilizing cations as Mg (col. 2, lines 47-50).

The anode and cathode comprising the spinel lithium metal oxide may be used in a solid electrolyte battery or in any other electrochemical cell, including liquid electrolytes (col. 4, lines 47-68). The electrolyte may be one containing a lithium salt in propylene carbonate (col. 5, lines 10-16).

The reference is only silent on the specific spinel structures written in their spinel notation, in the voltage of the anode and cathode, and in the mean oxidation state of the elements making up the spinel compound.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because the specific spinel structures fall within the general formula disclosed by the prior art. Thus the skilled artisan has sufficient skill to select the metal and oxidation number from a group of metals and a range of oxidation numbers to make a composition used for the exact same purpose as the material of the prior art.

Similarly, the voltage of the anode and cathode are seen as an obvious variant which is a direct result of the materials selected. Thus, if the instant materials exhibit a voltage of less than 3V or greater than 3V, the prior art's material must

Art Unit: 1111

have the capability of exhibiting the same voltage since the materials are the same.

7. Claims 1-20 are rejected under 35 U.S.C. § 103 as being unpatentable over EP 567 149.

The instant claims have been summarized supra.

The reference teaches a nonaqueous battery having a transition metal oxide capable of lithium insertion (page 3, lines 17-58). Specific anode materials as well as specific cathode materials are disclosed (page 3, lines 36-58). The electrolyte is disclosed on page 10, lines 2-54). In Table 2, the voltage of the anode material is seen at less than 3V.

The reference is only silent on the specific spinel structures written in their spinel notation, in the voltage of the anode and cathode, and in the mean oxidation state of the elements making up the spinel compound.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because the specific structures fall within the general formula disclosed by the prior art. Thus the skilled artisan has sufficient skill to select the metal and oxidation number from a group of metals and a range of oxidation number to make a composition used for the exact same purpose as the material of the prior art.



Serial Number: 08/206,792

-9-

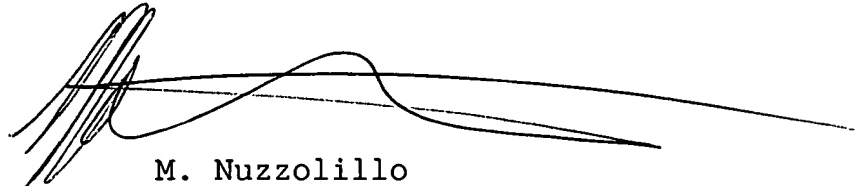
Art Unit: 1111

Similarly, the voltage of the anode and cathode are seen as an obvious variant which is a direct result of the materials selected. Thus, if the instant materials exhibit a voltage of less than 3V or greater than 3V, the prior art's material must have the capability of exhibiting the same voltage since the materials are the same.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to M. Nuzzolillo whose telephone number is (703) 305-3776.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0661.

The Fax number for Group 1100 is 703-305-3599 or 703-305-3600.

A handwritten signature in black ink, consisting of several overlapping loops and a long horizontal stroke extending to the right.

M. Nuzzolillo  
Patent Examiner  
Art Unit 1111

mn  
February 5, 1995